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EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 05/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/914,103	CHO, CHANG JE	
	Examiner	Art Unit	
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/15/2004 has been entered.

Response to Amendment

Amendment After-Final Rejection filed 1/16/2004 has been entered following aforementioned Request for Continued Examination. In said Amendment Applicant amended claims 1-10 through substantial amendment of independent claim 1. Applicant amended the Specification to comply with the necessary requirement of inclusion of a sentence within the Specification to state that the present application is a continuation of International Application PCT/KR00/00119 filed on February 15, 2000, as required by 35 U.S.C. 120. Said necessary requirement is herewith fulfilled. Moreover, Applicant has filed a certified copy of the application in Korea as required by 35 U.S.C. 119(b).

Response to Arguments

2. Applicant's arguments filed 1/16/2004 have been fully considered but they are not persuasive. In particular,

(1) With regard to the allegations in "Applicant's opinion about rejection reason 'I-1-1'":

Examiner had required a plot of entropy produced in the rectifying device as a function of time or the equivalent thereof. This requirement was prompted by the allegation by Applicant that his invention contradicts the second law of thermodynamics and that the rectifying function of the device by Applicant is able to operate without supply of energy: see, for instance, Specification, page 5. Said allegation is true if and only if said plot of entropy or the equivalent thereof shows a decrease of the entropy produced in said rectifying device. See, for instance, S.R. de Groot and P. Mazur, "Non-Equilibrium Thermodynamics", Dover Publications, Inc., New York (1983) (original publication: 1961, North-Holland Publishing Company), in particular Chapter III, § 1, Formula (2) (page 20). Applicant's complaint as to the complexity of the required task is therefore not justified in view of the nature of Applicant's allegation, said required task being merely needed for proper disclosure of Applicant's invention.

Applicant's allegation to have "measured power consumption in a resistor 8" is unsubstantiated because Applicant's continued reluctance to provide an error analysis makes it impossible to know the value distribution of said measured power consumption, and hence makes it impossible to provide a bound on said power consumption, which is, however, necessary to reach any conclusion as to whether the second law of thermodynamics has been violated. It needs to be emphasized here that error analysis is a necessary and integral part of any experimentation in the physical sciences. The examiner is thus faced with the most peculiar circumstance that, what may be hailed as an historic breakthrough in both fundamental physics and energy technology if true, is not even accompanied by a minimum standard of quantitative

documentation necessary for the verification of even the most modest of scientific discoveries or technological inventions.

Applicant further states that it is "very difficult to understand the entropy state of the system" (page 9 of Remarks). Yet Applicant has alleged that $dS_i < 0$, where S_i is defined as the entropy produced inside the device: see page 5, line 5. Applicant must now accept that the consequence of his allegation is his burden of proof, which requires the equivalent of an article on the experimental physics that justifies his allegation, including an extensive error analysis. In particular, Applicant must in said error analysis

(a) provide a bound within which the device can be considered to be a closed system, if at all; i.e., to which extent the entropy flow "dS_e" supplied to the device by its surroundings may contribute to the alleged 'observation' of entropy loss inside the device, which is possible if dS_e is negative (cf. S.R. de Groot and P. Mazur, loc.cit.), and document the factual basis for said bound;

(b) amplify (from zero) why the experimental results "could not be explained with existing scientific theories" (page 6, lines 19-20 of Specification); thus far Applicant has entirely failed to explain his result based on existing theories. For instance, existing theory holds that the entropy source σ in the mass-density weighted time rate of change for the entropy density consists of several contributions from several thermodynamic forces, such as a change of entropy due to heat conduction, change of entropy due to Joule heating, and a change of entropy due to gradient in thermodynamic (chemical) potential, which is a measure of how much work is required to remove a particle within an assembly to which it belongs: when different media abut, as is the case in

Applicant's device, the difference in thermodynamic potential between said different media is indeed a thermodynamic force. In non-equilibrium thermodynamics, entropy changes are due to an imbalance between many differences in products of thermodynamic forces and their associated thermodynamic fluxes. Unlike statistical mechanics, non-equilibrium thermodynamics, based as it is on coarse graining over physically infinitesimal regions, is only the simplest of "existing theories" alluded to by Applicant. However, it is not even clear from the entirely incomplete and wanting disclosure of experimental data whether Applicant's findings could be explained by the expression for the entropy source (see Eq. (21) in Chapter III, §2, page 24, S.R. de Groot and P. Mazur, loc.cit.) that forms the basis of the explanation for a wide variety of transport phenomena, such as the generation of a directed current of electrons due to a difference between the thermodynamic potentials of two abutting substances.

(2) With regard to the allegations in "Applicant's opinion about rejection reason 'I-1-2'":

Applicant appears to consider his affidavit under 37 CFR 132, in particular his statement therein on the "general measurement value", "which can cover at least ten times of a real error value" adequate response to examiner's insistence on an error analysis. However, Applicant neither defines nor quantifies said "real error value", does not define sources of error and does not in any way provide a factual basis for his statement on said "general measurement value", while said "general measurement value" is in itself not well defined. Applicant continues by alleging that "thermal equilibrium has no non-equilibrium factors". However, the very existence in Applicant's

device of different materials already implies non-equilibrium. Applicant continues to allege that he "does not understand the use and meaning of the error bars" in the plots he has drawn. Examiner agrees, because error bars without defining the sources of experimental uncertainty they represent are ill defined.

Applicant, in his Remarks, page 12, alleges that the "spontaneous voltage output of the apparatus of the invention in a thermal equilibrium system can be confirmed as true. The fact that this phenomenon does not accord with the second law of thermodynamics can be verified" (final portion of page 12). However, as explained above, the very existence of materials with different thermodynamic potentials, -the latter are material properties (see any text book on thermodynamics or hand book on material properties), implies that the apparatus of the invention is *not* in thermal equilibrium. Spontaneous voltage output of the apparatus cannot be excluded even on the basis of non-equilibrium thermodynamics: again please be referred to Equation (19) of Chapter III (page 24) in de Groot and Mazur referred to above. Applicant has the burden to prove this in view of his statement on the contradiction between his findings and the second law of thermodynamics. With regard to Expression 1 on page 13, said statement is true but hinges on "self-contained" and "indefinitely", while Applicant has not provided any bound on the interaction of the system with its surroundings, and nor has he provided any estimate on the time scale during which the thermodynamic force existent in his apparatus by dint of its initial condition will be spent: which is in itself reason why an error analysis is necessary. Examiner does not know what Applicant wants to show through Expression 2: of course, this is true. What is in doubt is

Applicant's set of measurements and its explanation as given in the Specification. With regard to the truism of Expression 3, one might add that "disorder" is exactly quantified through the concept and quantitative definition of entropy, and that Eq. (21) in de Groot and Mazur should be evidence enough that in the evaluation of whether or not disorder increases many different effects have to be taken into account. For instance, a temperature difference between different parts of the apparatus where there was none before may develop because of the ohmic heating through the generation of a directed current caused by the difference between the thermodynamic potentials of abutting different materials. Within the context of standard theory said temperature difference does not show a contradiction with the second law of thermodynamics, as the amount of disorder has a local rate of change given by Eq. (21) as cited above.

Furthermore, Applicant states, inter alia: "Since all portions of the space have the same temperature there is no flow of heat" (page 14, third full paragraph). However, a well-known counter example to this statement is the Peltier heat (cf. page 352 in de Groot and Mazur, loc.cit.), one of several thermoelectric effects. Consideration of the mechanism of the Peltier heat is relevant in view of the thermodynamic force caused by differences in the thermodynamic potential of the abutting substances in the apparatus of Applicant. Another example of heat flow even under conditions of uniform temperature is the Dufour effect (cf. de Groot and Mazur, loc. cit., page 274), i.e., a heat flow due to a mass concentration gradient (even in the absence of any temperature gradient).

Next, with regard to Applicant's description of switch 7 (page 15, second paragraph – page 18) it should be clear that particularly when a switch is turned on the system is no longer in thermodynamic equilibrium if it ever was, because through said switch the system is connected with the circuit.

Furthermore, Applicant's discussion of the magnet 11 (page 16 of Remarks, second paragraph) and the role it plays in the experiments introduces further questions as to why Applicant has not considered the well-known galvanomagnetic effects, such as the Hall effects (cf. de Groot and Mazur, page 357), and well-known thermomagnetic effects such as the Nernst effect (cf. de Groot and Mazur, loc. cit., page 359).

On page 16, third paragraph, Applicant alleges that "in a self-contained thermal equilibrium system having a predetermined maximum entropy value, when entropy continuously increases in a particular portion of the system..., the entire entropy of the system cannot be prevented from exceeding the predetermined maximum entropy value without spontaneous decrease of entropy...in any other portion of the system". Applicant's argument is as deficient as it is irrelevant: it is deficient, because nothing prevents continuous decrease of a quantity bound by a maximum, while it is irrelevant because entropy flow does not contradict in the slightest the second law of entropy: see Eq. (12) of Chapter III in de Groot and Mazur, including the discussion of the entropy law prior to it. Counter to Applicant's argument that the expressions for the second law of thermodynamics cited in the text books contain no exact numerical value, there is nothing inexact in the differential equation, e.g., Eq. (19) in de Groot and Mazur, loc. cit.,

that governs the time rate of change of the entropy density, while the total entropy is simply the volume integral over the entropy density.

(2) With regard to the allegations in "Applicant's opinion about rejection reason 'I-1-3'":

With due appreciation for Applicant's recognition of the need for error analysis in the Specification, Applicant appears to misunderstand "error analysis" to be confined to "non-equilibrium factors" (see page 17 of Remarks). Applicant has to show the overall error bar on his measurements, based on a comprehensive error analysis, including but not confined to non-equilibrium effects, data acquisition errors, the influence of the surroundings on the device, etc.. The only objective significance of any quantitative experimental result depends solely on the probabilistic inference that can be attached to said quantitative experimental result, as for instance is formulated in the Student test, for which an overall error bar needs to be obtained. Applicant also misunderstands his measurement conditions as "thermal equilibrium", which they are not, if only for the inequalities between the thermodynamic potentials of the different substances out of which the device is constituted and because of the closing of the switch.

With regard to Applicant's comment on possibility of error due to temperature differences (page 18, second paragraph of Remarks), wherefrom does Applicant obtain his starting value of 0.1 degree Celsius? Directed currents due to differences in the thermodynamic potentials are bound to cause ohmic heating. Where is his analysis, both of the directed current due said directed currents and the resulting ohmic heating, not without, but with said germanium nano-particles, because Applicant's allegation of

contradicting the second law of thermodynamics applies to his device in which there are said Ge nano particles. A result of increased output voltage with, as compared to without, Ge nano particles as suggested by Applicant may or may not be interesting depending on the known results but fails to address the claimed invention, in particular the limitation "ambient temperature of said apparatus in a thermal equilibrium state is converted by itself so that said apparatus continuously produces DC electromotive forces".

The re-interpretation of "Error" (page 19, second paragraph) as adding to the measured output voltage is itself a misinterpretation of the concept of error. Applicant evidently appears to indulge in revamping not only statistical mechanics but also the entire body of human knowledge known as error analysis by his statement that a true value containing no error at all is obtained (sic) (page 19).

Applicant's discussion on whether the Minimum True Value exceeds the Maximum Value of Error (page 20) is entirely void of substantiation on the value of said Maximum Value of Error due to the unfortunate circumstance that a comprehensive error analysis is lacking. Once again, a temperature difference appears to be the sole thermodynamic driving force in the mind of Applicant (pages 21-23), with a value of 0.1 degrees Celcius being adopted for no apparent reason. Examiner refers to the above discussion on the importance of thermodynamic potential gradients and differences as possible thermodynamic forces.

In conclusion, Applicant's remarks fail to address the key issues of contention (I-1-3), which are (a) no error bars have been presented, Applicant's alleged error values

being completely unsubstantiated, (b) no error analysis has been conducted to explain the size of the possible (overall) error in the measurements, and (c) no estimate is given of the expected voltage predicted according to perfectly conventional statistical theory for the experimental conditions of Applicant's device.

(3) With regard to the allegations in "Applicant's opinion about rejection reason 'I-2'":

Once again, Applicant mischaracterized his device as a thermal equilibrium system and considers no other thermodynamic force but temperature gradients or temperature differences (page 24 of Remarks). This is a mistake, given the ample literature on the subject, with reference once more to de Groot and Mazur (loc. cit.), see e.g., Eq. (21) of Chapter III, in which the entropy production consists of a sum of 2+n+r products of thermodynamic forces and fluxes, where n is the number of material components and r is the number of different chemical reactions. Applicant alleges: "the measurement was performed under circumstances without any other available energy source (e.g., chemical potential energy)". This is not true: the different substances in the device all have different thermodynamic (chemical) potentials. The conclusion by Applicant that "therefore, it can be estimated that the heat in the thermal equilibrium system has been transformed into the electromotive force" is wholly unsubstantiated. Applicant proceeds by asking the examiner if he has "a conclusion that the actual measurement value provided by Applicant contains no true value at all". Examiner does not know, as Applicant has not provided the burden of proof, while in the absence of proof serious doubt in the veracity of the claimed invention is based on the cosmic body

of experience and data concerning systems satisfying the second law of thermodynamics. Therefore, Applicant's question is not appropriate. Within the context of this application it is instead appropriate for the examiner to ask Applicant to prove that said actual measurement value does contain a true value. Applicant's opinion (page 25), "that the invention claimed by Applicant requires future efforts for clarifying the principle or law" (underlying its basic mechanism) would only be only true *if* the basic facts concerning Applicant's findings would have transpired from the Specification. They have not.

(4) With regard to the allegations in "Applicant's opinion about rejection reason 'I-1-3'":

Examiner believes to have commented exhaustively to Applicant's statements on his reluctance to provide the required plot of entropy change or the equivalent thereof in the above paragraphs so as not to have to comment on the issue of this plot once again.

With regard to the admitted translation problem from Korean into English Applicant is reminded that foreign priority can be granted only if the foreign priority document exactly discloses the application as filed in the United States. Furthermore, while Applicant alleges that the "expression 'without supply of energy' can never be said to be wrong, since the thermal equilibrium system cannot be an energy source for producing mechanical energy in (the) view of the second law of thermodynamics" (page 26) this allegation is surprising since Applicant maintains that his device contradicts said

second law of thermodynamics. The logical conclusion is that Applicant must believe his interpretation of his device as claimed to be in error.

With regard to the classification of Ge (germanium) as a metal, the only material embodiment of the metal of Applicant, see, for instance the "Dictionary of Science and Technology", Academic Press, ISBN 0-12-200400-0 (1992), page 926, in which germanium is characterized as a "nonmetallic element". Independent upon nomenclature, Ge is an insulator under undoped conditions and is a good conductor when doped. See, for instance L.E. Vorobyev, "Germanium", Chapter 2 in "Handbook Series on Semiconductor Parameters", pp. 33-57, has a energy gap of 0.66 eV at room temperature to within a few percent or so (see pages 34-35). Said energy gap corresponds to an equivalent temperature of about 7,000 K, hence it is impossible for electrons to jump across the energy gap at room temperature, and hence there are no conduction electrons in un-doped germanium at room temperature, which is a most distinguishing feature compared with metals; while doped germanium exhibits either p-type conductivity or n-type conductivity dependent upon the dopant, which is again a most distinguishing feature as compared with metals. Applicant's argument is thus not acceptable.

The description of the process of formation of the Ge nano particles (pages 27-35) is appreciated but fails to show particles of uniform size and distribution. Both "uniform size" and "uniform distribution" are idealizations in need of quantification when claimed. No such quantification in the form of variances for both size and distribution is

contained in either the Specification, the Declaration, or the currently presently Remarks.

In view of the above, examiner must seriously disagree with Applicant's allegation that "the original specification of the present application does not contain wrong or insufficient description or expression as presented" at least in view of the wholly unsubstantiated implication through claim 1 of the contradiction of the second law of thermodynamics.

(5) With regard to Applicant's opinion on the claim rejections under 35 USC 112, first paragraph,

Applicant states that "Applicant's opinion on the enabling of the invention has been fully presented already in the Applicant's opinion on rejection reason 'I'". Examiner has included comments above on said Applicant's opinion on rejection reason 'I', which comments are included herewith by reference. With regard to the further elaborations by Applicant on page 36, they are not responsive to the basis of the stated absence of enablement, which is the lack disclosure of the claimed invention through the lack of disclosure of the limitation "ambient temperature of said apparatus in thermal equilibrium is converted by itself so that said apparatus continuously produces DC electromotive force".

Applicant is noted to state his opinion (page 37) that "it is unreasonable to discuss the enabling of a technology, which has never been discussed in the world nor been completely understood yet, without direct tests". Examiner disagrees. Nothing in the Specification constitutes evidence that the measurements enable aforementioned

limitation, because said measurements have not been subjected to a bona fide error analysis through which aforementioned limitation is shown to be correct. Possible explanations, within the context of the scant numerical information contained in the Specification and as are readily offered by the standard theories of non-equilibrium thermodynamics and non-equilibrium statistical mechanics, have not been included in a quantitative manner so as to enable aforementioned limitation.

Applicant alleges (page 37) the examiner to be incorrect in stating the technological subject in the original claims 1-3 not to be included in the amended claim 1. However, scrutiny of the old claims1-3 and the new claim 1 immediately reveals that the original claim language has been completely revamped through Amendment A. As to Applicant's repeated protestation to examiner's insistence that a plot of entropy versus time or its equivalent be produced, Applicant's own claim necessitates such requirement, being equivalent to the allegation that the entropy indeed diminishes over time in a closed system. Examiner stresses again that this requirement is necessary but not sufficient in view of the bounds required on the entropy flow through the boundary of the system as evident from de Groot and Mazur, Eq(1) of Chapter III (loc. cit.).

Rejection of claims 1-10 under 35 USC 112, first paragraph on account of the claimed "monolayer", is withdrawn based on Applicant's amendment, but only on said account, not on account of the lack of enablement of the rectifying function.

(6) With regard to Applicant's opinion on the claim rejections under 35 USC 101, first paragraph,

Applicant appears to disagree on account of having "verified" that the apparatus and method of claims 1-10 are enabled. But such verification is utterly lacking in the Specification. Reproducibility tests dated November 25, 2003 as described by Applicant do not at all appear to demonstrate that within the error bar of the experiment the measurements can not be explained as being consistent with the second law of thermodynamics for reasons amply elaborated above, at least including (but not limited to) the peculiar circumstance that no consideration has been given to the thermodynamic potential (chemical potential) as a thermodynamic force pertinently existing in the device by virtue of the different constitutions, hence different thermodynamic potentials, of the materials of which said device is constituted.

Applicant's concern (page 40) that examiner "may not have understood as yet the expression "heat of a body is spontaneously converted to electric energy" is perfectly the same as the expression "heat of a thermally moving electron is converted to electrical energy through violation of the second law of thermodynamics" can not be laid to rest: they are NOT the same since directed electron flow is only one form of electric energy (other forms are, e.g., ionic oscillations and ionic displacements), although the latter quote is a special case of the former. Applicant's conclusion that examiner shows "insufficient understanding of the fact there exist no theory nor knowledge yet, by which electric energy spontaneously outputted from a thermal equilibrium system can be explained" (page 40) is based on a misinterpretation of what examiner wants Applicant's Specification to show, namely a purely experimental proof that the claimed subject matter is enabled. This has nothing to do with attempts to

"understand" the phenomenon claimed by Applicant, but instead is simply a requirement that Applicant shows he has his experimental facts as claimed right. Applicant can be assured that "no reproducible violation has ever been found" is not the basis for a conclusion that the invention is not enabled. However, a lack of disclosure that indeed a reproducible violation *has* been found by Applicant as claimed *is* a solid basis for concluding that the invention is not enabled. Applicant has introduced into the claims the contradiction of his experimental facts with the second law of thermodynamics without any substantiation through juxtaposition of said experimental results with the prediction based on existing theory founded on the second law of thermodynamics.

Applicant's conclusion on the exemplary actual test communicated in Remarks (pages 41-42)

ad a) is incorrect because temperature difference or gradient is by far not the only thermodynamic force, as explained several times above;

ad b) and c) do not justify the conclusion that the rectifying phenomenon "has no relation with the temperature difference and/or chemical potential between two abutting substances, because the same substances abut irrespectively of the variations conducted through steps e) and f), and, more importantly, no juxtaposition is at hand between the experimental results and the predictions based on conventional theory.

Based on these comments the Specification must be objected to and claims 1-10 must be rejected as follows:

Specification

Applicant's statement that his invention contradicts the second law of thermodynamics and the rectifying function of the device as being able to operate without supply of energy are unsubstantiated, considering the absence of a plot of entropy as a function of time or the equivalent of it. Applicant should provide that plot in a manner that enables a straightforward verification of said statement or withdraw all reference to the device as a rectifier and the rectifying function of said device in the sense given to this term by Applicant, namely as a device and function, respectively, capable of defying the second law of thermodynamics, to operate without the supply of energy, or the physical equivalent of such statements.

2. Furthermore, the specification is inconsistent with the Declaration under 37 C.F.R. 1.132 referred to above:

The material characterization of the "metal particles" is in stark contrast with said Declaration, because Ge (i.e., germanium) is not a metal but instead is a semiconductor (see page 1, step 5, ad 1.1 and page 2, step 2 ad 1.2); while nothing in either the original specification or the aforementioned Declaration explains how the metal particles are uniformly distributed (page 35, lines 10-15), or even how they are made to be of uniform size (page 35, lines 10-15), *a forteriori* not how the metal particles are regularly dispersed (cf. page 36, lines 3-6). Great effort is required to provide any regularity of an array of nano-sized particles because the scale of regularity necessarily also is in the nanometer range, while nothing is mentioned about how this is arranged.

Applicant should resubmit the specification with all material pertaining to the above mentioned objections fully removed.

Appropriate action is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. ***Claims 1-10*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contain subject matter not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In particular claim 1 contains the limitation that "ambient temperature of said apparatus in a thermal equilibrium state is converted by itself so that said apparatus continuously produces DC electromotive force". Nothing in the Specification indicates how ambient temperature of said apparatus in thermal equilibrium is converted *by itself* so that said apparatus continuously produces DC electromotive force, while such conversion as admitted and stressed by Applicant in his Specification would constitute "a contradiction with the second law of thermodynamics". The characterization of the apparatus as "in a thermal equilibrium state" has not been shown to be correct, and, in fact, is known not to be correct: any apparatus by definition needs constructing, which already implies a non-equilibrium state. In the underlying case, said apparatus comprises an aggregate of

different materials. Nothing in the Specification shows how an aggregate, consisting of materials with different thermodynamic potentials, can possibly be in thermodynamic equilibrium: the Specification does not provide any prescription for it, while differences in thermodynamic potentials within a substance, or gradients in the thermodynamic potential within a substance, constitute an important form of non-equilibrium force (see e.g. de Groot and Mazur, "Non-Equilibrium Thermodynamics", Dover Publishing Co.,1984 (original: North-Holland Publishing Co., 1961), Chapter III). *Applicant has contained no comparison with standard theory including a mathematical statistics analysis or error analysis to show that said conversion indeed occurs "by itself", rather than being driven by thermodynamic forces known in the art*. Said comparison would necessarily involve an error analysis in which the conversion by itself as claimed would be shown to exceed the overall error bar that incorporates the effect of measurement errors, imperfect thermal insulation of said apparatus, and the relative order of competing non-equilibrium effects such as current driven by thermodynamic potential gradients or differences. Therefore, to ascertain whether one ordinarily skilled in the art could use the invention as claimed would require the needed experimentation to discover how said conversion could possibly occur by itself. In view of the circumstance that there has never been a case in which the second law of thermodynamics has been contradicted by experimental results considering *the present state of the art*, said needed experimentation is undue and unreasonable. Furthermore, *ordinary skill in the art* is not enough to carry out said needed experimentation, because there is a difference between the disciplines of electrical engineering and experimental statistical

physics. Although Applicant has supplied further details of the method of manufacturing his apparatus through Affidavit 1.132 filed 3/11/2003 and through Responses to Office Actions mailed 3/20/2002 and 7/14/2003 said further details fail to show how the aforementioned limitation is enabled; if anything they show a lack in the *amount of direction by inventor* with regard to the directions how to manufacture the device as given in the Specification.

The essence of the claimed conversion resides, as judged from the Specification and from aforementioned Affidavit and Responses in the claimed nano-particles layer "in which a plurality of conductive and of a predetermined minute size, nano particles (sic) that are insulated from each other, are arranged as a substantially regularly and uniformly dispersed single layer" has "electrical contact with said first charge movement barrier layer". This implies that indeed the contradiction to the second law of thermodynamics is to be found among an extremely wide variety of material embodiments, as all materials can be broken down to the nano-level, while all metals, semimetals and semiconductors must be characterized as conductive. Furthermore, especially in view of the needed comparison with standard theory the nano-particles are ill-defined in size, despite certain indications of a range including 2 to 5 nm. For instance, a Ge sphere of 2 nm only contains fewer than 200 atoms, but a Ge sphere of 5 nm already contains about 3,000 atoms, approaching the physically infinitesimal size needed for the justification of a continuum description used in thermodynamic considerations and based on standard statistical physics underpinning. Therefore,

Applicant's conditions vary widely indeed. In summary, then the examiner notes the claimed subject matter not to have been disclosed along *the breadth of the claims.*

As to *the nature of the invention*, it is nothing short of a *perpetuum mobile*, claimed but not enabled, the very essence of the finding (the electromotive force) not having been quantitatively juxtaposed with standard theoretical predictions for the same apparatus based on an overwhelmingly substantiated body of knowledge and experimental experience that supports the second law of thermodynamics.

Applicant has provided *no existing working models.*

Examiner, in view of the above, concludes that *the quantity of experimentation needed to make or use the invention based on the content of the Specification is unreasonably large*.

Examiner concludes in view of the above, that the lack of enablement of Applicant's invention implies a lack of its utility.

Claim Rejections - 35 USC § 101

5. ***Claims 1-10*** are rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a specific asserted utility or a well established utility.
In the absence, in the Specification, of reproducible and statistically meaningful data in support of Applicant's statement that the "apparatus" device of claims 1 – 9 and the "method of obtaining a desired DC electromotive force" of claim 10 contradicts the second law of thermodynamics, said "apparatus" of claims 1 – 9 and said "method of obtaining a desired DC electromotive force" of claim 10 lack enablement, as detailed

above under item 2. In view of this lack of enablement, said "apparatus" of claims 1-9 and said "method of obtaining a desired DC electromotive force" of claim 10 are also lacking in patentable utility as neither a specific asserted utility nor a well established utility can be derived from the Specification.

N.B.: Claims 1-10 also rejected under 35 U.S.C. 112, first paragraph. Specifically, since the claimed invention is not supported by either a substantial asserted utility or a well established utility for the reasons set forth above, one skilled in the art clearly would not know how to use the claimed invention. See above under 35 USC 112, first paragraph.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
May 1, 2004

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